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ABSTRACT

The purpose of this research was to examine 18- to 30-month-old children's use of scripts for representing common events. A script is defined as a model that specifies the roles and props appropriate to an event and identifies a sequence of acts for achieving the goal defined by the event. Two aspects of script knowledge were investigated: (1) the development of the ability to maintain the appropriate temporal order of events within a script and (2) the development of the ability to represent social roles within a script. The white, middle-class sample consisted of boys and girls from four age groups: 18, 22, 26, and 30 months of age. A total of nine action sequences was modelled for each child--three using a single doll as a passive recipient of action (bathing, eating, and going to bed), three composed of nonmeaningful combinations of script sequences, and three using one doll as an independent agent and one as a passive recipient of action. All sequences were four acts in length. Several measures summarizing subjects' imitation task performance were scored. Results demonstrated that children as young as 18 months of age incorporate information about the temporal order of actions in their script knowledge of events. Few children demonstrated an understanding of differentiated role structures. Age differences were found, but these appeared to be more quantitative than qualitative in nature. (RH)

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THE DEVELOPMENT OF SCRIPT KNOWLEDGE IN CHILDREN

from

18 to 30 MONTHS OF AGE

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The purpose of this research was to examine the use of scripts for representing common events by children from 18 to 30 months of age. Research on the structure of thought in older children and adults (Nelson, 1978, 1981; Nelson & Gruendel, 1981; Schank & Abelson, 1977) indicates that common events like eating a meal or taking a bath are represented in thought using script structures. A script is a model of an event that specifies the roles and props appropriate to the event and identifies a sequence of obligatory and optional acts for achieving the goal defined by the event. For example, a script for taking a bath might include the roles of parent and child, props such as a bathtub, soap, toys, and washcloth, and the goal of cleaning the child. The specific sequence of actions to be followed in order to accomplish the goal might include obligatory acts like filling the bathtub with water and washing the child, as well as optional acts like playing with bath toys and kicking in the water. The use of scripts by children older than three years of age has been well documented, but relatively little is known about the early development and use of script structures in younger age groups. The purpose of this research was to investigate script knowledge in these very young children.

The initial studies of script knowledge in children were begun with the expectation that the ability to generate scripts would develop from the production of disjointed, unordered accounts of events by younger age groups to the generation of more ordered, conventional scripts by older children. Surprisingly this expectation was not supported (Nelson & Gruendel, 1981). Children as young as three years of age asked to recall stories describing common events almost always mentioned the component acts in the correct order. However, some age differences were found in the type of scripts produced. Younger and older children remembered the same number of basic or obligatory acts in the script, but older children remembered more optional or "filler" acts. Thus, with age and experience, children's scripts became more complex and capable of greater specificity with the inclusion of more optional components.

The failure to find large differences in the script knowledge of children after three years of age indicates that it is necessary to look at younger age groups to

understand the early stages of script development. Research on the use of scripts by children under three years of age is scarce. However, related work on play in young children suggests that certain script components, specifically action sequences and role concepts, undergo considerable developmental change in the first three years.

The ability to generate sequences of meaningfully related acts is essential for the development of scripts. In addition, scripts require that action sequences be temporally ordered when the relation between acts is "causal", for example, a child must be undressed before being placed in the bathtub. The production of related sequences has been observed in the play of children by 19 months of age (Fenson & Ramsay, 1980). However, it is uncertain whether temporal order in these sequences is maintained. Using an imitation task, O'Connell, Gerard and Leong (1983) found that before age two, children recognized that certain groups of actions went together, but it was only after age two that the temporal order of the actions was preserved. In contrast, Fenson and Ramsay (1980) reported that the large majority of sequences produced by children two years of age and younger in spontaneous play were temporally ordered.

O'Connell et al. (1983) may have failed to find preservation of temporal order in younger age groups because they used scripts that were more representative of an adult's rather than a child's early script knowledge of events. For example, turning out the room light was included as part of a going to bed script. In this study it was hypothesized that the temporal order of acts within a script would be maintained by children under two years of age if the acts comprising the scripts were centered around the child's own body. This would maximize the likelihood that the scripts used would be representative of the child's own knowledge of events.

A second component of scripts that has received some attention in the play literature is the development of role concepts. Several studies indicate that children do not attribute independent agency to dolls in play until about two years of age, and they do not attribute behaviour to dolls characteristic of specific roles until between two and four years of age. Social or complementary roles in which both participants are independent agents of action are not represented in doll play until four years of age

(Watson & Fischer, 1980; Wolf, 1982; Wolf, Rygh, & Altshuler, 1984). In this study the early stages of social role development were investigated by observing how children between 18 and 30 months of age represent multiple roles within the same script, for example, a mother and a baby. It was hypothesized that children learn the behaviours appropriate to a role before they learn to attribute role behaviours to specific others. Thus, children learn the sequence of acts comprising a script but these acts are not differentiated and assigned to specific roles. For example, in a bath script the mother doll is treated identically to the baby doll and washed in the bathtub as a passive recipient of the child's actions. Following the development of the concept of independent agency, role differentiation occurs with action sequences restricted to specific others. The mother doll now becomes an independent agent in the bath script and the baby doll is the passive recipient of the mother's bathing and drying actions.

In summary, two aspects of script knowledge were investigated in this research: (1) the development of the ability to maintain the appropriate temporal order of events within a script and (2) the development of the ability to represent social roles within a script. These aspects of script knowledge form the foundation for the mature scripts observed in children by three years of age.

METHODS

Subjects

The sample to date is composed of the following numbers of children from four age groups: 18 months (9 males, 6 females), 22 months (9 males, 8 females), 26 months (9 males, 8 females), and 30 months (6 males, 6 females). The total sample when complete will include 18 children (9 males, 9 females) in each of the four age groups. The sample is exclusively white and middle class.

Procedures

The children were tested individually with a caregiver present. The imitation task used was adapted from O'Connell et al. (1983). The children first observed the modelling of either a simple script for a familiar event or a random sequence of actions, and then they were given the dolls and props used in the modelling phase and verbally prompted to imitate the modelled event. A total of nine sequences were modelled for each child - three script sequences (bathing, eating, and going to bed) using a single doll as a passive recipient of action, three mixed sequences composed of nonmeaningful combinations of the same acts comprising the script sequences, and three script sequences using two dolls, one as an independent agent and one as a passive recipient of action. The content of the script sequences using two dolls was the same as that for the single doll script sequences. All sequences were four acts in length, and the single-doll script and mixed sequences were presented first and in alternating order. The two-doll script sequences were always the last three sequences presented to each child. The order of presentation for the specific, single doll script and mixed sequences was counterbalanced across subjects within each age group. All sessions were videotaped, and the scoring of each child's performance was done from these tapes.

Measures

The sequences of actions performed by each child in the imitation task were transcribed from the videotapes. Several measures summarizing each child's performance were scored from the transcripts:

1. Total number of acts performed, scored separately across the three single-doll script sequences and the three mixed sequences. This score included the performance of both modelled and non-modelled acts.
2. Percentage of modelled acts imitated, scored separately across the three single-doll script sequences and the three mixed sequences.
3. Forward sequencing score, reflecting the children's ability to preserve the temporal order of the modelled acts in their own imitations. This measure was

computed separately for each of the three single-doll script sequences and for each of the three mixed sequences. These separate scores then were averaged to form mean forward sequencing scores for the script sequences and for the mixed sequences. The forward sequencing measure was adapted from O'Connell et al. (1983) and was defined as the number of transitions from modelled action to modelled action in the child's imitation that preserved the modelled order. Once a single transition was established, scoring stopped if an action occurred out of order. The maximum score for each sequence was three. For example:

Child's Behaviour		Scoring Code
Child undresses doll		1st modelled act
	1	
Child puts doll in bath		2nd modelled act
Child turns on taps		not modelled
	2	
Child soaps doll		3rd modelled act
Child turns on taps		not modelled
	3	
Child dries doll		4th modelled act
Forward sequencing score =	3	

4. Role imitation score. The child's level of role knowledge was scored for each of the three script sequences using two dolls. Five levels of performance were scored.

Level 0	Child does nothing or fails to manipulate either doll
Level 1	Baby doll treated as passive recipient of action; mother doll ignored
Level 2	Mother doll and baby doll treated as passive recipients of actions
Level 3	Mix of levels 2 and 4
Level 4	Baby doll treated as passive recipient of action and mother doll treated as independent agent

Each child received a single role score for their highest level of performance across the three script sequences using two dolls.

RESULTS

Temporal Order

The first analyses addressed the issue of whether children prior to two years of age were capable of maintaining the appropriate temporal order of events within a script. A 4 (age : 18, 22, 26, 30) x 2 (sex : male, female) x 2 (condition : script, mixed) repeated measures analysis of variance was conducted with the mean forward sequencing score as the dependent variable. Significant main effects for age ($F(3,53) = 15.38$, $p < .001$) and condition ($F(1,53) = 249.83$, $p < .001$) were found, as well as a significant age x condition interaction ($F(3,53) = 5.60$, $p < .01$).

The significant condition main effect indicated that the temporal order of the modelled acts was preserved better for the script than the mixed sequences. Paired-t tests comparing the mean forward sequencing scores for the script and mixed sequences within each age group showed that the condition effect was present at all ages (all p's $< .05$). Children in the younger as well as older age groups showed an awareness of the temporal order of events in the script sequences which was not as well maintained for the mixed sequences (see Table 1). However, some differences among the age groups were found. Post hoc comparisons between means indicated that the size of the difference between forward sequence scores for the script and mixed sequences was smaller for the 18 month olds than for the older age groups (all p's $< .05$). In addition, 18 month olds produced shorter sequences of temporally related acts for both the script and mixed sequences than any of the other three age groups (all p's $< .05$).

The script relation among the acts within a sequence appeared to facilitate the children's ability to imitate the temporal order of the acts. It also appeared to enhance the children's memory for the acts themselves. A 4 (age : 18, 22, 26, 30) x 2 (sex : male, female) x 2 (condition : script, mixed) repeated measures analysis of variance with the percentage of modelled acts imitated as the dependent variable yielded significant main effects for age ($F(3,53) = 10.08$, $p < .01$) and condition ($F(1,53) = 145.10$, $p < .001$). Post hoc comparisons between means indicated that 18

months olds imitated fewer modelled acts than the older age groups (all p's <.05). However, acts in script sequences were imitated more frequently than acts in mixed sequences at all ages (see Table 2). These findings were not simply an artifact of differences in the children's manipulation of the toys in the script versus mixed sequences. A 4 (age : 18, 22, 26, 30) x 2 (sex : male, female) x 2 (condition : script, mixed) repeated measures analysis of variance with the total number of acts performed as the dependent variable yielded no significant condition or age effects. However, there was a significant sex x condition interaction ($F(1,53) = 5.74$, $p < .05$). Across all age groups, the total number of acts performed for the script versus mixed sequences was similar among the females but clearly different among the males. Males performed significantly fewer total acts for the mixed than for the script sequences (see Table 3).

Role Knowledge

Level of role knowledge across the age groups was compared using a Friedman's analysis of variance with each child's best role score as the dependent variable. No significant changes in role knowledge with age were found ($X^2(3) = 4.12$, $p = .25$. Most children within this age range either treated the baby doll as a passive recipient of action and ignored the mother doll (Level 1), or assimilated the mother doll to the baby doll's role and treated both as passive recipients of action (Level 2). There was a weak trend for children in the older age groups to show role differentiation within their modelled scripts, but the number of children demonstrating role knowledge at these higher levels (Levels 3 and 4) was too small to constitute a statistically significant trend.

DISCUSSION

The results of this research clearly demonstrate that children as young as 18 months of age incorporate information about the temporal order of actions in their script knowledge of events. These findings extend the results of Nelson and Gruendel (1981) to

younger age groups, and are in contrast to O'Connell et al's (1983) report of an absence of temporal order knowledge in children prior to two years of age.

The positive findings of this research are likely due to a more suitable method for the age group under study and the specific scripts selected for modelling. The length of the test session was much shorter in this study than in the O'Connell et al. (1983) research. In addition, only scripts composed of acts directly centered around the child's own body were used, because these were considered most likely to represent the child's own script knowledge of events. Knowledge of the temporal order of events is demonstrated in many domains during the infancy period. It underlies the complementary social games played by infants and caregivers throughout the first two years (Ratner & Bruner, 1978) and is inherent in the performance of any skilled action, for example, means-ends tasks which are performed by children before the end of the first year. It is only reasonable to expect that knowledge of temporal order would be a basic component of script knowledge from the earliest ages. The results of this research support this expectation for children as young as 18 months of age.

Although children as young as 18 months of age did demonstrate knowledge of the temporal order of events within a script, there were differences between these children and the older age groups. The 18 month old children produced shorter sequences of temporally ordered acts and imitated fewer modelled acts than children 22 months of age and older. These differences may represent changes in memory functioning and/or differences in the complexity of the script knowledge children bring to the experimental task. Age differences clearly were present in the data, but these appeared to be more quantitative than qualitative in nature.

Few children in this study demonstrated an understanding of differentiated role structures as a component of their script knowledge of events. Children appear to learn the sequence of acts comprising a script before these acts are differentiated and assigned to specific roles. In all age groups, the dominant form of responding was to ignore the mother doll or to assimilate the mother doll to the baby doll's role and treat both as passive recipients of action. A few children in the 22, 26 and 30 month groups

did show some evidence of differentiated role structures, but the numbers of children were too small to constitute a significant trend. An understanding of independent agency may be a prerequisite for differentiated role knowledge, but it clearly is not sufficient, or more children in the 26 and 30 month groups would have performed differentiated actions with the mother and baby dolls. Additional support for this conclusion comes from the observation that some children in the study demonstrated knowledge of independent agency in the absence of role differentiation. For example, they treated the baby doll as an independent agent but assimilated it to the mother's role. Although differentiated role knowledge was not clearly established in this group of children a cautious approach to these findings is recommended. These results may underestimate the degree of role differentiation, particularly in the older age groups, because the task requirement of manipulating a doll to act as an independent agent was physically difficult for many children.

In sum, this research demonstrated that children as young as 18 months of age incorporated information about the temporal order of actions in their script knowledge of events. Differentiated role structures were not clearly established in the 18 to 30 month age range, suggesting that children may learn the sequence of acts comprising a script before these acts are differentiated and assigned to specific roles.

Table 1

Mean Forward Sequencing Score by Age Group and Condition

	Condition	
Age Group	Script	Mixed
18 months	.8	.1
22 months	1.5	.5
26 months	2.0	.6
30 months	2.1	.8

Table 2

Percentage of Modelled Acts Imitated by Age Group and Condition

	Condition	
Age Group	Script	Mixed
18 months	49.5	32.2
22 months	73.5	45.1
26 months	81.8	49.0
30 months	88.9	56.3

Table 3

Total Number of Acts by Condition and Sex

	Condition	
Sex	Script	Mixed
Male	26.8	21.2
Female	26.5	27.7

Table 4

Percentage of Children by Age Group Achieving Each Role Score as Their Best Level of Performance

	Level of Role Knowledge				
Age	0	1	2	3	4
18 months	.20	.33	.47	.00	.00
22 months	.06	.35	.53	.00	.06
26 months	.00	.47	.35	.06	.12
30 months	.00	.25	.59	.08	.08

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